WHAT IS CLAIMED IS:

1. A plasma reactor system for processing a substrate, the plasma reactor comprising:

a processing chamber for containing a plasma, the plasma comprising at least one plasma product for processing the substrate;

a gas inlet coupled to the processing chamber for providing gas to the processing chamber;

a first power source;

an induction coil, coupled to the first power source, to couple power from the first power source into the processing chamber to sustain the plasma;

a plasma shaping member positioned within the processing chamber, the plasma shaping member having a recessed portion substantially above the center of the substrate and an extended portion outside the recessed portion; and

a support for the substrate positioned such that the substrate is exposed to the at least one plasma product during processing.

2. The reactor system of claim 1, wherein the material comprising the plasma shaping member is selected from the group consisting of quartz, silicon carbide, ceramic, and metal.

3. The reactor system of claim 1, wherein the electrical potential of the plasma shaping member is floating relative to ground during processing of the substrate.

4. The reactor system of claim 1, wherein the plasma shaping member is configured such that the recessed portion and the extended portion face the substrate.

5. The reactor system of claim 1, wherein the outside diameter of the plasma shaping member ranges from 60 to 90 percent of the diameter of the substrate.

6. The reactor system of claim 1, wherein a Z dimension of the plasma shaping member is greater than from about 10 to 15 percent of the outside dimension of the

plasma shaping member, and less than from about 25 to 30 percent of the outside dimension of the plasma shaping member.

7. The reactor system of claim 1, wherein an X dimension and a Y dimension of the plasma shaping member are each between 0.3 and 0.5 inches.

8. The reactor system of claim 1, wherein the sum of an X dimension and a Y dimension of the plasma shaping member are each as great as at least 10 percent of the height of the processing chamber.

9. The reactor system of claim 1, wherein the plasma uniformity is better than about ±15 percent.

10. The reactor system of claim 1 further comprising a top wall of the processing chamber, and wherein the plasma shaping member is positioned adjacent to the top wall of the processing chamber.

11. The reactor system of claim 1, further comprising a split Faraday shield.

12. The reactor system of claim 1, further comprising a charged particle filter.

13. The reactor system of claim 1, wherein the plasma shaping member is configured such that high temperature electrons are produced adjacent to the induction coil and are substantially blocked from diffusing toward the center of the processing chamber.

14. The reactor system of claim 1, wherein the plasma shaping member provides a surface on which positive ions from the plasma and negatively charged species from the plasma may recombine.

15. The reactor system of claim 1, wherein the uniformity of the ion flux to the substrate is better than ±15 percent.

16. The reactor system of claim 1, wherein the maximum potential surface over the substrate is substantially flat.

17. A method of processing a substrate in a reactor system, the method comprising the steps of:

providing a processing chamber;

coupling power into the processing chamber to produce a plasma from which at least one product is used for processing the substrate;

providing a plasma shaping member within the processing chamber;

exposing the substrate to the at least one plasma product for processing.

18. The method of claim 17, further comprising the step of producing a plasma with an ion current density uniformity less than plus or minus 10 percent over the majority of the substrate for a processing chamber diameter less than 1.3 times the size of the substrate.

19. The method of claim 17, further comprising the step of producing a substantially flat maximum potential surface over the substrate.

20. The method of claim 17, further comprising the step of recombining positive ions and negatively charged species on a surface of the plasma shaping member.

21. The method of claim 17, further comprising the step of preventing high temperature electrons produced adjacent to the induction coil from diffusing toward the center of the processing chamber.